

AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated below:

1 1. (currently amended) An initiator node for a
2 storage area network, the node intended to be coupled
3 over ~~a~~ the storage area network to at least one
4 storage node having command queue capability, the
5 initiator node comprising:

6 at least one processor capable of executing
7 instructions;

8 a memory system having stored a current queue
9 depth, and a maximum queue depth associated with each
10 storage node of the at least one storage node;

11 wherein the memory system stores

12 instructions for initializing the maximum queue
13 depth for the at least one storage node to a value
14 dependent on a type of the at least one storage node,

15 instructions for limiting the number of commands
16 queued to a storage node of the at least one storage
17 node to the current queue depth associated with the
18 storage node, and

19 instructions for dynamically adjusting the
20 current queue depth associated with the storage node
21 based upon queue refusals generated by the storage

22 node and the maximum queue depth associated with the
23 storage node.

1 2. (original) The initiator node of Claim 1,
2 wherein the instructions for dynamically adjusting
3 the current queue depth include instructions for
4 adjusting the current queue depth associated with a
5 storage node downwardly when the current queue depth
6 is greater than a minimum queue depth and the storage
7 node refuses to queue a command issued by the
8 initiator node, and for adjusting the current queue
9 depth upwardly when the current queue depth is less
10 than the maximum queue depth associated with the
11 storage node and that storage node has not refused to
12 queue any commands issued by the initiator node for a
13 determined period of time.

1 3. (original) The initiator node of Claim 2
2 wherein the instructions for dynamically adjusting
3 the current queue depth include instructions for
4 monitoring logins, and for adjusting the current
5 queue depth downwardly when a login by an additional
6 initiator node is recognized.

1 4. (currently amended) In a storage area
2 network node, a method of controlling a maximum
3 number of commands queued to a storage node
4 comprising the steps of:

5 maintaining a maximum queue depth associated with
6 the storage node and initializing the maximum queue
7 depth according to a type of the storage node;

8 maintaining a count of outstanding commands that
9 have been submitted to the storage node;

10 maintaining a current queue depth associated with
11 the storage node and initializing the current queue
12 depth to a value not less than a minimum queue depth
13 nor greater than the maximum queue depth;

14 holding commands for later submission to the
15 storage node if the count of commands that have been
16 submitted is greater or equal to the current queue
17 depth;

18 adjusting the current queue depth associated with
19 a the storage node downwardly when the current queue
20 depth is greater than the minimum queue depth and the
21 storage node refuses to queue a command issued by the
22 initiator node; and

23 adjusting the current queue depth upwardly when
24 the current queue depth is less than the maximum
25 queue depth associated with the storage node and the
26 storage node has not refused to queue any commands
27 issued by the initiator node for a first
28 predetermined period of time.

1 5. (original) The method of Claim 4, further
2 comprising the step of adjusting the current queue
3 depth associated with the storage node downwardly is
4 permitted to occur no more than a predetermined
5 number of times in a second predetermined period of
6 time.

1 6. (original) The method of Claim 5, wherein
2 the predetermined number of times is one.

1 7. (original) The method of Claim 5, wherein
2 the first predetermined period of time is adjusted
3 dynamically.

1 8. (original) The method of Claim 5, further
2 comprising the steps of:

3 maintaining a second maximum queue depth
4 associated with a second storage node and
5 initializing the second maximum queue depth according
6 to a type of the second storage node;

7 maintaining a second count of outstanding
8 commands, indicating commands that have been
9 submitted to the second storage node and have not
10 completed; and

11 maintaining a second current queue depth
12 associated with the second storage node and
13 initializing the second current queue depth to a
14 value not less than a minimum queue depth nor greater
15 than the second maximum queue depth.

1 9. (original) The method of Claim 5, wherein
2 the step of initializing the current queue depth
3 initializes the current queue depth to a value
4 dependent upon a number of initiator nodes known to
5 be logged-in to the storage area network.

1 10. (new) An apparatus having computer readable
2 instructions, the apparatus comprising:.....

3 first maintenance means for maintaining a maximum
4 queue depth associated with a storage node, the
5 maximum queue depth initialized according to a type
6 of the storage node;

7 second maintenance means for maintaining a
8 current queue depth associated with the storage node,
9 the current queue depth initialized to a value not
10 less than a minimum queue depth nor greater than the
11 maximum queue depth;

12 first adjustment means for adjusting the current
13 queue depth associated with the storage node
14 downwardly when the current queue depth is greater
15 than the minimum queue depth and the storage node
16 refuses to queue an issued command; and

17 second adjustment means for adjusting the current
18 queue depth associated with the storage node upwardly
19 when the current queue depth is less than the maximum
20 queue depth associated with the storage node and the
21 storage node has not refused to queue any issued
22 commands for a first predetermined period of time.

1 11. (new) The apparatus of Claim 10, wherein
2 the first adjustment means adjusts the current queue
3 depth associated with the storage node downwardly no
4 more than a predetermined number of times in a second
5 predetermined period of time.

1 12. (new) The apparatus of Claim 11, wherein
2 the predetermined number of times is one.

1 13. (new) The apparatus of Claim 10, wherein
2 the first predetermined period of time is adjusted
3 dynamically based on whether the current queue depth
4 is being adjusted upwardly and/or whether the current
5 queue depth has been adjusted downwardly during the
6 first predetermined period of time.

1 14. (new) The apparatus of Claim 10, further
2 comprising:

3 third maintenance means for maintaining a second
4 maximum queue depth associated with a second storage
5 node, the second maximum queue depth initialized
6 according to a type of the second storage node; and

7 fourth maintenance means for maintaining a second
8 current queue depth associated with the second
9 storage node, the second current queue depth
10 initialized to a value not less than a minimum queue
11 depth nor greater than the second maximum queue
12 depth.

1 15. (new) The apparatus of Claim 10, wherein
2 the current queue depth is initialized to a value
3 dependent upon a number of initiator nodes logged-in
4 to a storage area network.

1 16. (new) The apparatus of Claim 15, wherein
2 the current queue depth is updated upon login of a
3 new initiator node to the storage area network.

1 17. (new) The apparatus of Claim 10, further
2 comprising:

3 third maintenance means for maintaining a count
4 of outstanding commands that have been submitted to
5 the storage node; and

6 means for holding commands for later submission
7 to the storage node if the count of commands that
8 have been submitted is greater or equal to the
9 current queue depth.

1 18. (new) The apparatus of Claim 10, wherein
2 the apparatus comprises a storage area network node.

1 19. (new) The apparatus of Claim 10, wherein
2 the apparatus comprises a computer program product.
